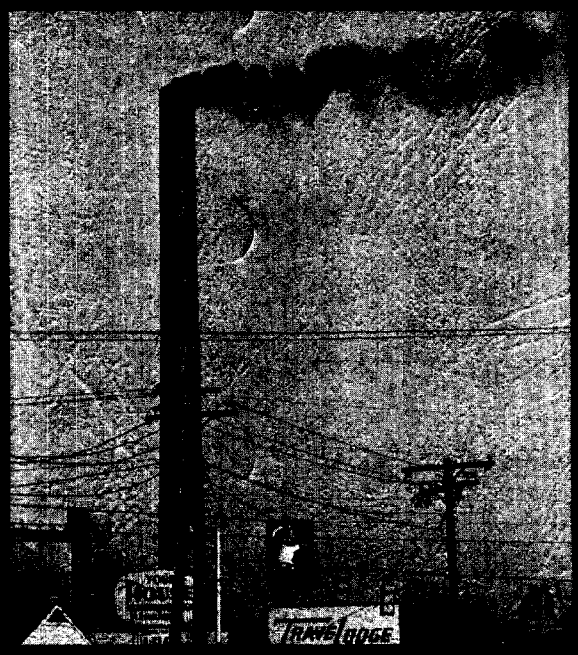
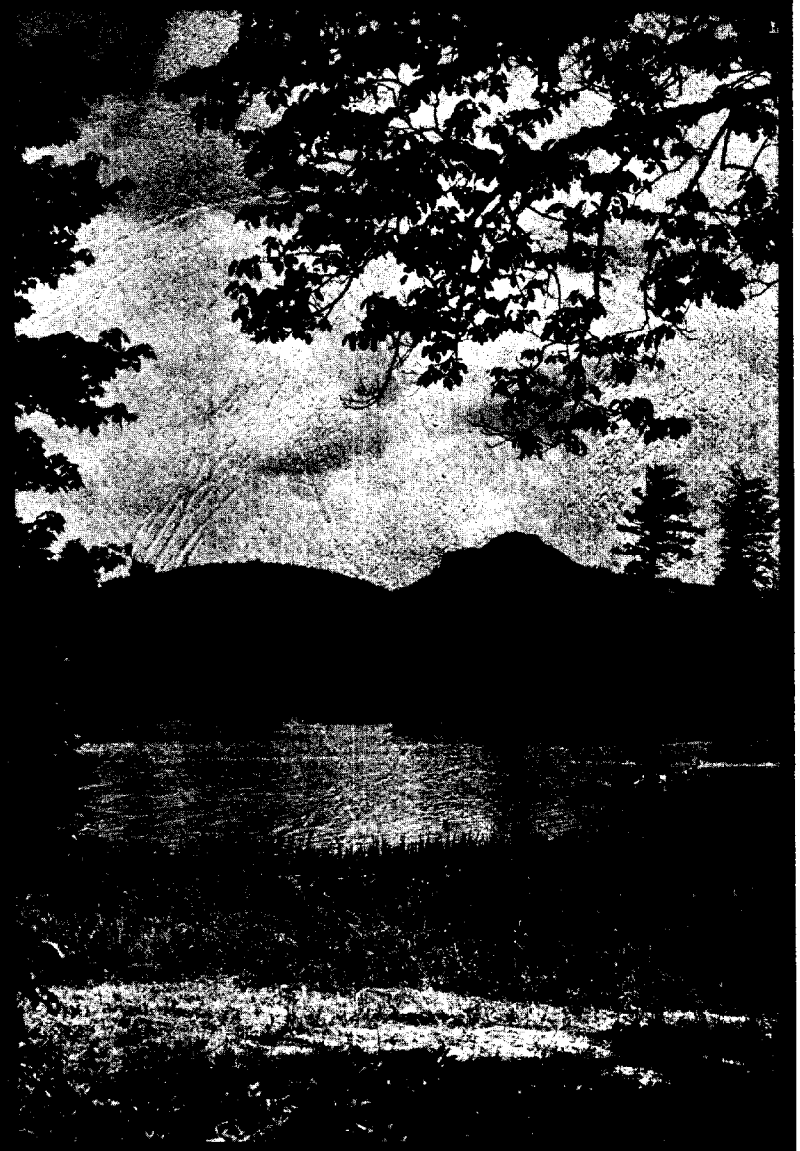
CRITICAL ENVIRONMENTAL AREAS OF NORTH CAROLINA

STATE PLANNING REPORT
146.10





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AUTHOR	:	Richard R. Wilkinson R. Paul Darst Department of Landscape Architecture North Carolina State University
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ABSTRACT

The project examines the basic uses of North Carolina's environment. Prime lands for agriculture, forestry, wildlife management, recreation, scenic value, waters for commercial and sport fishing, and areas of scientific, cultural, and historic significance are delineated on the maps. Each of these uses is considered valuable to the overall well being of the State. Each function also requires intensive management to maintain the environment in a condition suitable for that use.

Urbanization is a general term for influences that are deleterious to those uses. Urbanization is considered to include housing, commercial facilities, major highways, industrial development, power generation, and other uses that are not intrinsically related to the land's natural productivity. The conditions caused by urbanization which affect the basic functions are air pollution, water pollution, flood damage, and land degradation through piecemeal ownership patterns.

The basic uses of the land are critical from an environmental, economic, aesthetic, and cultural standpoint. The impact on them from urbanization is a serious threat to their continued functioning.

The project explores this impact and the nature of its deteriorating influence as well as the areas of most serious impact.

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by
Richard R. Wilkinson
R. Paul Darst
Department of Landscape Architecture
North Carolina State University

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State Planning Division
Department of Administration
State of North Carolina

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INTRODUCTION

Portrayal and discussion of environmentally critical areas of North Carolina can be developed through two distinct sets of insights. One is a description of the inherent capability of the land to sustain various uses, and the second is a description of contemporary practices and the nature of their interaction on the landscape. Ideally, the former should be developed prior to attempting a description of the impact of current activities. This discussion focuses simultaneously on both. Absence of satisfactory criteria for assessing environmental quality as well as the data necessary to support judgments require that a morphological approach to defining critical environmental conditions be developed.

The maps, as they are set forth, can be used in both ways; but the text is concerned with describing the impact of man's various activities on each other.

Every region and landscape of the State has dominant uses which are supported through land ownership, public policy, interest group pressures, and real needs. In many cases, these uses are well advanced and definitively not in accord with ecologically sound criteria. Examples of such uses are urban development in flood plains, wetland drainage for agriculture, or construction on barrier island dunes. The basic question centers about the focus of a reorganized land policy.

It would be desirable to build a future policy on complete and detailed knowledge of the physical resource base.

This does not seem practical in light of time and cost constraints. An alternative to this method is control of the change process.

Results of change produce the most distressing environmental problems, and resolution of these problems must ultimately be an integral part of the process itself. This points toward the need for an understanding of the effects of change of the landscape on the landscape itself at the finest grain of detail. Land use change can conveniently, if not with complete accuracy, be categorized as urbanization. Urbanization can, in turn, be measured in several dimensions, which for the purposes of this discussion are unimportant. The important consideration is the process, the length of time over which it occurs, the types of component increments and the effect of these increments on other aspects of land use and value.

Urbanization, as a disjointed and incremental management process, is inexorable. As long as land is measured in terms of monetary value, the types of uses to which it is put will become more intense and singularly efficient. Forests will be converted to farms, farms to factories, and factories to cities. Ability to protect and conserve systematically more organic attributes of the land are dependent upon seeing them in light of this process.

The ensuing discussion is based on this interpretation. The accompanying maps may serve independently as a beginning for either of the two viewpoints.

1. Urbanization and its impact on resource management.

2. Intrinsic capability of the land for desired uses.

Supposing the latter were the more proper interpretation for the mapped information, the landscape of North Carolina could be classified in the following way:

1. Critical Areas

Those singular areas which have the widest range of suitability for specific organic uses. As an example, land most suitable for forestry is also useful for recreation and scientific purposes. It may also fall in a particularly scenic region and be the habitat for valuable or endangered game and fish species. This combination could be gained from overlaying the various maps and outlining the areas of overlap. Extrinsic activities occurring or proposed in critical areas would then be subject to severe controls to ensure that they would not seriously alter the organic uses.

2. Sensitive Areas

Areas having only two simultaneously suitable organic uses would require general controls on land use change, such as zoning, plan approval, and other devices normal to the regulatory process.

3. Development Areas

Development areas are not specifically critical to any of the basic organic functions. Land use change could occur in these areas according to present guidelines.

This system, while meaningful in the overall organizational effort necessary to establish a land policy that will control

deleterious acts, is not sufficient to focus on the problem. The problem, as viewed in this discussion, is urbanization. The impact of urbanization is felt in each of the functional land use groupings. The critical nature of each of these groups must be described in conjunction with a description of the impact produced by urbanization.

URBANIZATION

Urbanization is not a stable condition but a continuous process. The process can be described in various ways including physical condition, physical impact, and population. The measures considered in this description are population density and the nature of its impact on natural systems of the environment. Population has been projected from 1960 through the 1970 census to 1980 and 2000. Densities of 100 people per square mile have been projected on a township basis to indicate those areas in the State which have entered or are soon to enter the urbanization process.

One hundred people per square mile generally represent the transition from rural to urban. It is not until the population reaches 1,000 people or more per square mile that an area can be considered urban. Between 100 and 1,000 per square mile, the urban pattern and the structure of its impact on the environment is created. Normally, this takes place without urban planning institutions for schools, thoroughfares, land use allocation services, and utilities. By the time the 1,000 people per square mile figure is reached and necessary planning institutions established, the problems are ingrained and not readily soluble.

From a wide range of problem categories, four have significance to this discussion:

1. Land modification through grading, creation of impoundments, and road locations.

2. Alteration of the natural drainage system through

sealing of aquifer recharge areas, concentration of runoff with resultant increases in flood peaks, erosion from modified landscapes with resultant stream siltation and channelization of natural water courses.

3. Degradation of land ownership units into smaller and smaller parcels. This issue has the most serious impact in terms of two conditions:

a. The increasing number of independent owners lying within natural watersheds or other features make independent alterations of the landscape which aggregate in terms of their negative environmental impacts. Resolution of these impacts is virtually impossible given the number of independent owners and the embryonic nature of institutions and agencies created to resolve them.

b. The original subdivision of land involves separating individual parcels from productive farms, pasture lands, orchards, or woodlands. In many cases these are relatively large lots, involving ten acres or more, on which crops for household use are grown or animals are kept. Their location is as much dependent on the productivity of the land as it is on proximity to places of employment and service. As numbers accumulate, proximity to employment, services, schools, stores, formal recreation facilities,

and other urban features become dominant. At this time, natural productivity loses its value to strictly commercial or site value. This takes place only after the initially important natural productivity has been destroyed or severely altered.

The result is environmental deterioration and a structure of roads, utilities, and services which is inefficient and resistant to positive and economically feasible changes because of the number of ownerships involved. This condition is known as urban sprawl and is prevalent in North Carolina.

4. The fourth impact is air and water pollution. Improper treatment facilities and an inadequate number of enforcement personnel suffer from the onslaught of pollutant producers. Serious water and air pollution conditions are a result of the aggregation of many small incidents and occurrences. By the time the severity is recognized, the pattern of pollution input is established, and abatement measures are enormously expensive.

Urbanization is portrayed as both a basic use of the land and a critical environmental condition. As a basic use, the map represents a projection of current trends. In terms of its impact on the environment, it is related to its allied conditions of air pollution, water quality deterioration expressed through stream classification standards, increased

flood potential represented by incursion of urban type development into flood plains, and as a self-imposed threat based on the nature of its uncontrolled and degrading effect on the landscape. These conditions are reflected in the Urbanization and Critical Conditions Map. They are compared with all other base uses to outline areas of existent or potential conflict.

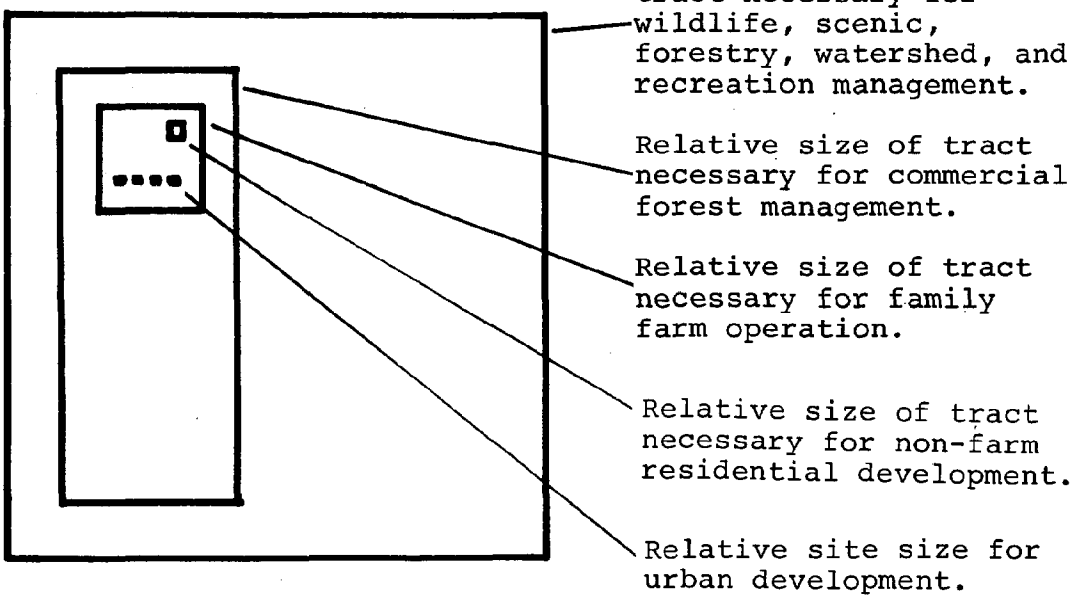

DIAGRAM NO. 1: The degradation of land tracts into progressively smaller and less environmentally dependent units thwarts subsequent attempts to rebuild and reconstruct natural systems and their function.

Environmental Areas threatened by urbanization	By means of:	With these results
Flood plains	-filling in flood plains -building dams -building structures	-loss of wildlife habitat -loss of life in floods -property damage -loss of recreation potential
Scenic areas	-road building -scattered housing -electric lines -power plants -industry	-loss of scenery -public beauty converted to private gain
Recreation areas	-road building -deforestation -building structures -building 1st or 2nd homes	-loss public access -less escape from city -more public demand for recreation -conversion of potential public good to real private gain
Prime forest land	-displacement of land for housing and industry -displacement for 2nd homes -scattered development	-loss of high quality forest -increased demands for lumber from public lands -lost recreation -more land logged per capita from poorer quality forest
Prime agricultural land	-displacement of land for housing and industry	-loss of rural scenery -more land/capita required of poorer agricultural land -economic inefficiency in farming

Historic sites	-displacement or paved over -damage from air pollution	-elimination of historic landmark
Scientific areas (archaeological)	-excavation of site -building over	-lost opportunity to learn man's history or prehistory
Wildlife habitat	-building -flooding -excavation -displacement -water pollution	-more species endangered -more species extinct
Areas of frequent hurricane damage	-build towns and cities in prone areas for hurricanes	-loss of life and structures
Areas of frequent air inversions	-build towns, cities, and industry in valleys of stagnant air	-Los Angeles, California -impairment of crop and forest production -destruction of historic sites
Estuaries	-displace for housing and industries -pollute	-more fish endangered -economic loss to fishery

CHART NO. 1.

Harmful environmental conditions fall into two categories: natural and man-made.

1. Earthquakes. Earthquake and fault zones. Some areas in the Piedmont and Mountain regions of North Carolina have experienced tremors during recorded history. Severity and extent of occurrences do not warrant rating earthquakes as a current or potentially severe critical condition. Fault lines, as they exist in the State, are stable and have caused negligible damage. Rock slides and slippage occur in the mountains but are so localized in their impact as to be beyond normal predictive capability.

2. Hurricanes significantly affect the Barrier Islands, sounds, marshes, estuaries, and adjacent low-lying areas. A hurricane is a cyclonic storm characterized by winds in excess of 60 miles per hour, a diameter of 25 miles or more, and excessive rainfall in a short duration. The combination of wind and rain functions to produce abnormally high tides and wave action which back up water into estuaries, channels, creeks, and overland areas. In combination with high winds, the damage produced is extensive and does have a severe impact on areas beyond the immediate path of the storm. The greatest measurable impact is on structures and buildings, farm crops, and roadbeds. Fisheries and forests are also susceptible to damage. Man-made alterations of the coastal landscape are most severely affected and tend to increase the impact on other related functions by removing natural

stabilizing features such as the dune system and the absorptive capability of the marshes and wetlands.

3. Floods are a natural occurrence on all streams. The base of a stream valley from the banks at normal flow across the natural berm to the foot of the valley walls is the natural flood plain. During floods, this area becomes the channel. The area of a flood plain considered most critical in engineering/hydrologic calculations is that portion necessary to carry the runoff from a storm of 100-year frequency.

Valleys in a natural forested condition tend to retard the accumulation of runoff and reduce the severity of floods in terms of their height or velocity As the uplands of a valley develop, absorption is impeded. Crests and velocity increase, amplifying the flood's destructive capability.

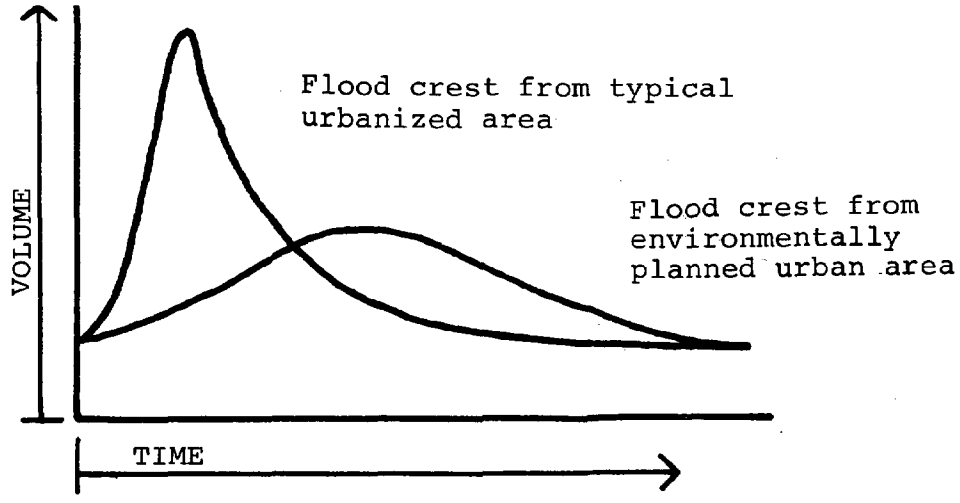

DIAGRAM 2: The generalized diagram of a flood mass in two differently used basins indicating the nature of urban development on the flood dynamics of a stream.

Sprawl development increases the severity of floods. This is an incremental process which evolves with the build-up of density in an urbanizing area. Corollary development of the flood plain for urban type uses is subject to the brunt of the increased destructive power of the flood.

4. Air inversions are a natural phenomena, occurring most frequently in regions with well-defined ridges and valleys. They occur as cold air masses move over depressions, trapping warm air under them. Frequency of occurrences is related to topographic relief, and the possibility exists for inversions in relatively flat regions.

The critical factor engaging inversions is the quantity of harmful pollutants in the air at the time of occurrence. Pollutants which exist below critical levels during normal conditions aggregate when trapped to produce increasingly harmful concentrations.

Potential for inversions in North Carolina is most critical in the northwest and southwest corners of the State with a probable thirty days in five years. Probability for such conditions in the Piedmont is twenty days in five years the Coastal Plain up to ten, and the coastline from zero to ten.

Concentration of pollutants in the State's air has not reached hazardous proportions. Abatement measures are ostensibly preceding apace with development. The sprawling nature of urbanization tends to thwart the effectiveness of such procedures by spreading the sources into every area of the State.

The four most severe substances are carbon monoxide, sulphur oxides, nitrogen oxides, and particulates. Each in its own way is a threat to the habitability of urban areas, crops, forests, historic sites and buildings, game and wildlife management, scenic qualities, and recreation.

5. Water pollution is a moderate to severe threat to almost every aspect of the State's resource base. Pollution comes from many sources and in many forms. Suspended solids, silt, and debris come from land modification. Agriculture and deforestation cause turbidity, affecting visual quality of the streams and lakes. Chemical pollutants in the form of heavy metals such as mercury and metal salts, along with biochemical substances from farm runoff, urban runoff, industrial plant discharges, oil spills and mining operations are cumulatively degrading streams. Biological pollutants from animal and human wastes discharged directly into streams or coming from inadequate septic tanks and fields and inadequate treatment facilities introduce pathogenic substances into streams affecting people directly or indirectly through contamination of food or closing of streams to recreation uses. Thermal pollution from spent water in industrial processes is potentially harmful to the State's fisheries.

Either independently or cumulatively the impact on the considerable water resource of the State is felt in almost every area of activity. Water pollution is also an incremental process. It can begin with discharges from mutually remote sources and aggregate in small quantities until the

stream or lake is unfit for human use. It can exist permanently in still or slow moving bodies of water or proceed as a slug of polluted water in a faster moving stream.

AGRICULTURE

Agriculture represents a way of life as much as it does a use of the land. Productivity is in many ways a by-product of a life style. Changes in the settlement pattern of North Carolina pose a distinct threat to both aspects. Incipient urbanization consumes land and water, creates pollution, and forces land values and taxes beyond agricultural capabilities, displacing the farmer.

The farmer's dependence on the land's productive capacity is a relative condition based on many interlocking natural features. The basic feature is the soil resource followed closely by the land ownership pattern. Productive soil in urban usage is an invaluable resource lost forever.

Serious changes in ownership are occurring throughout the State. Farms on poor soil in the western Piedmont and difficult slopes of the mountains are being abandoned. Vast tracts of wetlands in the Coastal Plan are being drained and deforested to make large corporate farms. The areas along the expanding urban fringe and the second home complexes near recreation facilities are being converted into small parcels which collectively produce urban impacts. It is difficult to attach detailed significance to these activities. The soil base can be mapped and its value to the larger society interpreted as a critical natural resource. Among the many threats to agriculture, two are significant because they can be controlled -- urbanization and its counterpart, air pollution.

The soil base of the State has been classified and mapped in five broad categories. The level of detail is the soil association, and the interpretation is the percentage of farmable land within that association.

The categories are:

1. Eighty percent or more of the land can be farmed with normal management practices.

2. Sixty-six to eighty percent of the land can be farmed with normal management practices.

3. Sixty to sixty-six percent of the land can be farmed with normal management practices.

4. Fifty to sixty percent of the land can be farmed with normal management practices.

5. Less than fifty percent of the land can be farmed with normal practices.

The conditions which render land in any of the associations nonproductive are: excessive or inadequate drainage, steep slopes, shallow depth of soil, stoniness, and soil reaction (alkalinity or acidity). Categories one through four are critical to the future of this State. Their retention in a major part will ensure adequate productivity, offer an alternative to urban life, and maintain a margin of flexibility for the future.

MOUNTAIN REGION

Category 1: 80 percent or more.

Alluvial and terrace soils are capable of 80 percent productivity: They exist in flood plains and terraces

along streams. In combination there are about 60,000 acres in the mountain region. The most serious constraint to use is poor drainage on the alluvial soils and slope on terrace soils. Suitability extends from forestry to intensive cash crops and nurseries.

Category 2: 66 to 80 percent.

Edneyville-Balfour soils are capable of 66 to 80 percent use. They are moderately steep with slight erosion problems. They exist mostly on plateau areas and extend over 64,000 acres. They are suitable for pasture, orchards, and general crops.

PIEDMONT REGION

Category 1: 80 percent or more.

Alluvial soils extend over 10,000 acres in the Piedmont in the flood plains of rivers and streams. They have moderate drainage problems and are most suitable for forest management, grazing, or general crops.

Terrace soils are on moderately well drained, slightly sloping land adjacent to the flood plains. Occasional flooding causes some drainage problems across most of the 370,000 acres of the extent. Pasture, tobacco, and general crops are suitable.

Davidson-Mecklenburg soils are dark red clays on land sloping up to 15 percent. Erosion is a moderate to severe problem. The 520,000 acre area is suitable for general crops, forage, and forestry.

Category 2: 66 to 80 percent.

Appling-Cecil soils cover 2,200,000 acres of the Piedmont on slopes between 4 and 12 percent. They are subject to moderate erosion problems and suitable for general crops and dominant Piedmont tree species.

Cecil-Lloyd soils are light red clay loams on 4 to 18 percent slopes. Past and present erosion is a severe problem on much of 2,200,000 acres. General crops and forestry are suitable.

Iredell-Mecklenburg soils are fine textured clay loam soils on moderately severe slopes. Much of the 480,000 acres is suitable for forage, pasture, forestry, and general crops when properly managed.

Category 3: 60 to 66 percent.

Mayodan-Granville sandy loams cover 480,000 acres of the Piedmont. Steep slopes cause severe erosion problems. Many of the abandoned farms are made up of this soil type. The remaining land is excellent for tobacco with good management and otherwise suitable for pasture and forestry.

Category 4: 50 to 60 percent.

Granville-White Store sandy loams cover 180,000 acres in Randolph, Chatham, and Orange Counties. Potential erosion is high, but general crops are possible with adequate management.

COASTAL PLAINS REGION

Category 1: 80 percent or more.

Norfolk-Ruston soils cover 170,000 acres. The only

problem is difficult drainage which requires intense management. These soils are suitable for pasture and forestry. They are considered to be the most valuable soils in the State.

Dragston-Fallsington soils are poorly drained sandy loams over 225,000 acres of low-lying land along the sounds in the northeastern part of the State. When properly drained and managed, they are suitable for a wide range of crops and forestry.

Lynchburg-Rains soils are sandy loams requiring extensive drainage for general crops and forestry. They cover 750,000 acres in scattered areas across the eastern part of the Coastal Plain.

Terrace soils along the rivers are subject to occasional flooding. They range from well drained to wet and are suitable for general farming. They cover 150,000 acres.

Category 2: 60 to 66 percent.

Coxville-Bladen soils are wet clay soils covering 450,000 acres. They are difficult to handle but, when properly managed, are suitable for general crops and forestry.

Category 3: 50 to 60 percent.

Bladen-Elkton are wet, fine textured clayey soils requiring drainage for general crops. They cover 600,000 acres in the northeastern part of the State.

Craven-Shubuta (Caroline) soils are sandy loams with moderate drainage problems. They cover 870,000 acres and

are suitable for field crops and forestry when properly managed.

Lenoir-Coxville soils cover 630,000 acres. They are most suitable for forestry, pasture, and field crops.

Category 4: 50 to 60 percent.

Lakeland-Norfolk soils cover 1,300,000 acres mostly in the Sandhills. Excessive drainage, severe leaching, and wind erosion are major problems. They are suitable for forestry and general crops in selected areas.

FOREST LANDS

There are 33,735,680 acres of land and water in North Carolina. In 1964, 20,027,300 acres or 59.5 percent were in commercial forest land according to the United States Forest Service: 9,956,200 acres are in the Coastal Plain; 6,014,600 acres in the Piedmont; and 4,056,500 acres in the Mountain region. Of the total, 1,369,800 are owned by the Federal government; 373,200 by the State and local governments; 2,495,200 by the forest industry; 9,322,900 are owned by farmers with the remaining 6,466,200 held by miscellaneous individuals and corporations.

FOREST TYPES

White pine-hemlock forest group is part of the mountain forest complex. The white pine is the dominant species. They occur on steep and south facing slopes or in other areas as a result of fire or other disturbances.

Spruce-fir forests are above the 4,500 feet elevation in the mountains. The forest is best developed above 5,000 feet. Spruce-dominated forests exist in the lower reaches of the association, and fir dominates at the highest elevations.

Hardwood-pine forests extend from the mountain foothills into the Coastal Plain. Long-leaf pines and oaks dominate the Sandhills and dry uplands in the southeast portion of the Coastal Plain. Virginia pine is prevalent in the north central Piedmont. Loblolly and short-leaf pine are dominant in the inner Coastal Plain and across the central portion of the Piedmont.

Oak-gum-cypress forests are located in the wetlands and river bottom lands in the eastern Coastal Plain.

The major species in these associations occupy the following areas:

Softwood Types

White pine-hemlock	140,200	
Spruce-fir	14,700	
Long-leaf pine	462,100	
Slash pine	32,500	
Loblolly pine	3,121,300	
Short-leaf	1,079,700	
Virginia pine	789,100	
Eastern red cedar	28,200	
Pond pine	1,408,600	
Pitch pine	45,900	
Table-mountain pine	18,900	
Subtotal	7,141,200	Acres

Hardwood Types

Oak-pine	3,556,600	
Oak-hickory		
Chestnut-oak	275,800	
Scrub oak	198,900	
Other	5,541,200	
Oak-gum-cypress	2,680,900	
Elm-ash-cottonwood	324,600	
Maple-beech-birch	308,100	
Subtotal	12,886,100	Acres
Total	20,027,300	Acres

Critical limitations on the productivity of the broad forest associations are site quality and area conditions. Site quality is based on the capability of the soil and other factors in terms of mean annual growth. Growth is measured in cubic feet of merchantable wood per acre per year. Broadly conceived, there are four classes:

Class 1 - Sites capable of producing 120+ cubic feet/acre/year.

Class 2 - Sites capable of producing 85 to 120 cubic feet/acre/year.

Class 3 - Sites capable of producing 50 to 85 cubic feet/acre/year.

Class 4 - Sites capable of producing less than 50 cubic feet/acre/year but excluding unproductive sites.

Area condition classes represent land classified by growing conditions such as surface water, drainage, erosion potential, or problems susceptible to management practices designed to alleviate them. The condition depends on the stocking of the areas with commercially viable trees.

Presently, net growth is far below potential. About 15.2 million acres or 76 percent of the present commercial forest is capable of producing 50 cubic feet per acre per year. About 5.3 million acres are in site classes 1 and 2. Current net growth across the entire forest is approximately 48 cubic feet per year. Better stocking of trees, more effective replanting and reseeding practices, protection from fire and disease, and more efficient utilization of all products will increase the stand efficiency.

The large portion of the productive timber which is held by farmers and other non-commercial forest interests is subject to other management objectives. Conversion of timber stands to farm fields and to urbanization are deleting many acres each year. Simultaneously, the abandonment of farms is restoring areas to forests. This type of shifting is

difficult to predict and control.

Critical aspects of forest management to interests and values beyond the forest industry are maintenance of wildlife habitats, watershed protection, recreation and maintenance, and enhancement of scenic quality. Two relationships seem to be most pressing:

1. Maintenance of forest cover is critical to drainage related lands in and about the urbanizing area of the State. They include flood plains, steep slopes, drainage courses, coverage of highly erodible soils, and maintenance of absorptive areas for ground water recharge. These areas do not uniformly fall within the commercial forest site-indexing system, but the role of forest cover in such situations is of great value to the larger interests of the State.

2. Within the commercial forest enterprise, the areas capable of producing 85 or more cubic feet per year are the most valuable. Lower site classes can be created from shifting land usage but the degradation of highly productive sites is critical and irreparable. Lands in this class are closely related to and, in many cases, coincident with prime agricultural lands. Degradation of the ownership pattern of these lands into urban sites needs to be controlled.

The related map indicates land within site classes 1 and 2. It is compared with dominant species and/or forest types. The soil base is used as the prime indicator and the area designations are those soils which the Soil Conservation Service has mapped as being capable of producing high volumes

with management practices adequate for desirable species.

Maintenance of these areas alone will not provide enough wood to support the needs of the forest industry and its clients, but their diminution would severely hamper the attainment of that goal. Lower class sites are less critical and can be maintained through changes in land use and maintenance of an urban open space system.

RECREATION

Recreation includes many divergent forms of activity: competitive swimming, senior citizen bridge clubs, gardening, and other types of leisure time activities. Types of recreation under consideration in this discussion are categorized as outdoor recreation. This form is dependent on the use of the State's natural and historic resources. The areas considered critical are a composite of National and State parks, recreation areas, scenic areas, historic sites and districts, game lands, trails, public and some private forests, wildlife refuges, and scenic rivers. The lands and features are considered to be of State and, in some cases, National significance.

The basis for classifying these areas in the recreation category is their capability of supporting recreation complexes, including activities, services, accommodations, and access by one means or another.

The areas range from near wilderness lands to intensively developed day use areas. The focus of each area is the array of activities possible within the setting. Activities include sightseeing, hiking, swimming, boating, fishing, hunting, bird watching, collecting, skiing, and other pastimes dependent as much on the environmental context as on the developed provision of facilities.

Each of these activities is most successful in an environment free from the negative influences of urbanization, industry, pollution, and other non-recreational environmental

influences.

Activities in a sympathetic setting are the basic elements of a successful recreation area and form the supply side of the picture. Demand by users dictates that associated facilities also be present.

Accommodations include campgrounds, trailer parks, motels, hotels, and resort-type facilities. Each is or should be related to the resource-based activities.

Services including auto service stations, laundries, restaurants, souvenir shops, sport and equipment needs, interpretive and information facilities are also necessary.

Each of these types of development should be linked with the activity locations via a circulation system clearly within the environmental setting and can include highways, parkways, or trails.

Each combination of recreation area components should be organized about a specific user time budget that relates supply of facilities with demand for them. The smallest component of a time budget is the four-hour increment or the time between meals. Recreationists tend to plan activities and sequences of events around this type of budget. The least integrated development should be capable of supporting the desired number of people with activities, services, and circulation necessary to support a user for this amount of time.

A day use area requires facilities for two or three four-hour increments. This requires an array of activity

types about an organized service facility and circulation system.

An area catering to weekend or longer visits requires an integral accommodation complex and circulation system that links a wide array of activities into one complex recreation area.

The facilities designated in this discussion have the potential or are already developed for user accessibility and service and have a high quality environmental context.

SCENIC AREAS

Scenery falls into two categories:

1. Areas which have scenic and aesthetic objectives as part of the existing management framework.

   a. National Parks and Seashores

   b. State Parks

   c. National and State Wildlife Refuges

   d. National Forests

   e. Historic Sites

   f. Scenic Rivers (Proposed)

2. Regions of the State which have scenic qualities unrecognized by present public policy or private objectives.

Every part of the State is visually pleasant to some extent, but particular resource complexes are dominant.

   a. Mountain ridge and valley complex

   b. Major Piedmont river basins and Piedmont/Coastal Plain fall line.

   c. Estaurine complex of sounds, marshes, beaches, hammocks along the edge of the land mass

   d. The barrier islands

Delineation of scenic complexes is dependent on the visual relationship of dominant edges or changes in landscape features. The sea-land edge is visually strong. The term used to describe scenic impact is imageability or the potential for the scene to elicit recognition and recall from the viewer.

Degrees of imageability are dependent on the relationship between a scene's complexity and order. Complexity is the number or array of distinct elements within the view, and order is the visual relationships between them.

Elements are those features which have clear distinctions between them such as a land-water edge. Change in topography, vegetation masses, and ground surface material represents elements.

Their arrangement to form perceptible sequences of enclosures is the order function. Highly repetitive forms are most orderly, and discordant patterns with no apparent relationships are disorderly. High scenic quality exists if the scene is complex and orderly; i.e., there are a large number of elements in perceptible sequences of order. Low quality is ascribed to simple scenes without apparent order, such as the view from a flat straight road through a single species of cut over forest or through the jumble of signs and structures on a commercial strip.

Imageability says nothing of the viewer's preference for a scene. It is dependent on other factors and explains his subjective capacity to recall the elements along a pathway.

Scenic management should not focus directly on the arrangement of detail but on the organization of the framework in which detail is preceived. Detail and personal involvement is part of the preference function which operates best in an imageable environment.

The vantage point is critical in that it controls the array of elements. Speed of movement is controlled by the vantage point also. The longer a viewer has to decode the scene the more imageable and preferable it will be. Along an automobile route, the view is constantly moving and changing. Discordant edges confuse the viewer's capacity to understand and sense the order. To this end, the scenic qualities of a resource are best exposed by moving parallel with strongly imageable edges such as the Blue Ridge Parkway moving along the Blue Ridge. The panorama of the valleys can be portrayed against a consistent edge, relationship of topography and tree masses. The same is true of moving in a valley and viewing the hills or driving along a river's edge.

In this framework the outstanding undeveloped scenic resources of the State lie in corridors paralleling natural edges. Management involves properly locating the viewer's pathway or vantage point and preventing discordant features from obliterating the order attained from the vantage point location.

Visual enjoyment of the State's natural features could become a legitimate function of highway location and design. Land planning along the corridors can also adapt criteria for visual ordering of development and physical change of the landscape.

HISTORIC AREAS

North Carolina's patrimony is becoming a critical issue in the overall development of the State. Buildings, sites, artifacts, and districts which have historic merit either by integrity of location, purity of style, locational relevance to major events, or are indicative of trends in the development of the State are being threatened by modern urbanization and its by-products.

Present historic areas and sites administered by the Federal government and the North Carolina Department of Archives and History are the focus of this discussion. Other facilities of significance are operated by commissions and private individuals or firms. The main thrust of the publicly administered facilities is the accurate conservation of significant traditions and events.

Efforts have been made during the recent past to centralize Administration with Archives and History. Their professional staff and commitment to authenticity has the capability of identifying the most outstanding opportunities and restoring them with great attention and rigor. Their objectives are to bring the past to life as part of the ongoing life of the community. To date, funds have limited complete inventories and follow-up restoration, zoning and legal control devices.

Many examples, although not all, are single buildings in a museum setting divorced from the normal activity of the setting. An expanded program will consider the structure

or site in its total context, with equal emphasis on landscape and urban context design.

A major problem lies with the location of many significant opportunities. They are either in decaying center cities or impoverished rural communities. The necessary concern, financial, and knowledge resources are not available to mount public support and ultimate conservation.

North Carolina's patrimony is a vital nonrenewable resource which can only be developed with a concerted program integral with the mainstream of activity. Its potential for ameliorating urban blight and presenting the past to people in an understandable way is a legitimate concern of urban development.

WILDLIFE

Wildlife of interest to this discussion of North Carolina falls into three categories: game animals, fur bearers, and endangered species. The critical dimension to their conservation is habitat management. Urbanization brings about a decrease in range size which is critical to animals such as bears, alligators, and eagles. Each requires a large territory essentially free from man's influence. The eggs of the eagle and osprey are susceptible to DDT, and the eagle is especially intolerant of man's presence.

Mono-species forestry and industrialized agriculture reduce the amount of ecotones, or natural edges, that provide the best food sources. Large-scale agriculture which requires draining of wetlands is a serious threat to all forms of game animals through habitat destruction and management practices.

Wildlife is a mutual concern of scenic recreation, forest, and scientific area management. Currently, the resource is diminishing to protected lands only. These are not adequate for the task. Additional wetland protection and refuge areas are needed to control the elements of the habitat environment.

Game refuges provide adequate protection, and hunting lands both owned and leased are a major portion of the protection conservation system. Licensing of hunters and extensive use of wildlife officers supplement this system.

Major game animals in North Carolina include deer, bear, squirrel, rabbits, wild turkey, and waterfowl. Principal fur bearers are muskrat, raccoon, mink, otter, opossum, and the grey and red foxes. An exotic animal, the nutria, is replacing the muskrat and mink and is considered a threat to their survival.

Rare animals in need of protection through habitat preservation are pelicans, ospreys, bald eagles and red cockaded woodpeckers among the birds. Alligators, sea turtles and bog turtles, among the reptiles, are suffering from wetland and habitat destruction and coastal development. The black bear, because of its necessarily large range size, is disappearing from the scene in both western and eastern North Carolina.

FISHERIES

There are two types of fisheries in North Carolina: commercial and sport fishing. Except for the developing catfish farms, the commercial fishery is limited to the salt and brackish water of the coastal zone. The sport fishery includes deep water, sounds, inland streams and lakes.

The commercial fishery includes fin fish, shellfish and crustaceans. Fin fish are harvested from the open sea, the sounds, inlets, and estuaries; crustaceans along the open sea edge, sounds, and estuaries; and shellfish from the entire water complex. The principal shellfish are oysters taken from the sound, brackish water clams (Rangeia) taken from the sounds, and surf clams (Mercenarea) taken from the inlets and along the coastal shelf. Scallops are of two types: bay scallops are from the sounds and callico scallops from the open waters.

Crustaceans include primarily shrimp and crabs harvested from the entire complex. Dominant fin fish are the menhaden and alewife, sea bass, sea trout, and flounder. The striped bass, alewives and shad are anadromous, returning to fresh water streams to spawn, where they are also harvested.

Major threats to the commercial fishery are pollution, alteration of spawning grounds, and alteration or destruction of the food chain through dredging, filling, and silting of the marshes. Changes in salinity of the marshes and estuaries from increased land runoff will seriously hamper reproduction

and growth. Biological pollution from municipal and industrial sewage and septic tanks contaminates the shellfish, rendering them unfit for human consumption.

Sounds, marshes, and estauries are critical to the maintenance of a commercial fishery. Urbanization destroys the marshes and directly limits the productivity of the entire commercial and sport fishing industry.

The sports fishery includes deep sea fishing, sound fishing (salt and brackish), and inland streams. Major species include marlin, mackerel, blue fish and flounder from the sea, channel bass and flounder from the sounds, and black or large mouth bass and trout in the inland streams and lakes. The large mouth bass is found almost everywhere in Currituck Sound which is fresh to brackish water. Trout are found in the cool clear streams of the mountains. The speckled trout is native, and the rainbow trout and brown trout have been introduced. Additionally, the striped bass and shad which are anadromous are prime sport fish. Pan fish and catfish are caught in almost all the fresh waters of the State.

Threats to the sport fishery include the same conditions which are harmful to commercial fishing as well as the accidental introduction of the fresh water mill foil plant to the Currituck Sound. Fresh water game fish are intolerant of habitat changes such as temperature fluctuations from waste water or clearing of the forest canopy, siltation from agriculture or urban runoff, stream channelization and biological pollution.

Anadromous fish require pollution free streams and clear channels to return to their spawning grounds. Dams and other barriers stop their migration and destroy the reproduction cycle.

Pre-urban development poses a major threat to the commercial and sport fishery which is a touchstone of North Carolina history and accountsfor a significant portion of its tourist and production economy.

SCIENTIFIC AREAS

Areas with outstanding scientific value can be classified in three general categories: regions, sites, and misfits. Regions are areas such as salt marshes or swamps in the Coastal Plain that contain within their boundaries all the component natural systems necessary to support the total system without outside controls.

Sites comprise residual complex natural areas surrounded by modified landscapes which do not drastically alter the environment of the site itself. Controls are necessary to prevent deterioration and maintain an acceptable level of functional integrity for the site itself. Sites are such areas as bogs in an urban complex or stands of virgin forest in an otherwise commercially managed forest.

Misfits are remnant species of aberrations in the landscape produced by natural forces. A hemlock stand in the Piedmont or a huge dune on the barrier islands are examples.

The dominant features of the State portrayed in this discussion include all three types. National and State parks are in the scientific region class. Class A rated streams, wild, and scenic rivers, National and State forests, regional habitat tracts and State natural areas are scientific sites.

Misfits are champions of species and rare and endangered botanical species as well as niches of endangered animal species.

Inventories of significant features are underway but not nearly complete. Follow-up legislation is necessary and management responsibility needs to be decided and funded.

These resources are nonrenewable and subject to destruction by urbanization and its associated water and air pollution concentrations. In a sense, they represent a significant portion of the State's patrimony and are necessary to reveal the origins of the people to themselves.

MAP CONTENT SOURCES

NO.	TITLE	SOURCE
1.	URBANIZATION	
1.	Urban Area Incorporation Limits	N. C. Dept. of Trans.
2.	Present Areas w/100 People/s.m.	State Planning Div.
3.	1980 Areas w/100 People/s.m.	" " "
4.	2000 Areas w/100 People/s.m.	" " "
2.	FORESTRY	
1.	Dominant Forest Species	U.S.D.A. - Forest Service
2.	Soil Survey Interp. for Woodlands	U.S.D.A. - Forest Service
3.	AGRICULTURE	
1.	Agricultural Soil Cap. by % Farmable Land	N.C./A.S.S. Soil Survey w/Interp. by R. Horton of S.C.S.
4.	RECREATION	
1.	National Parks	U.S./N.P.S.
2.	National Forests	U.S.D.A./U.S.F.S.
3.	National Rec. Areas	U.S./N.P.S.
4.	Public Game Lands	U.S./B.S.F.W. N. C. Div. of Wildlife Res. Div.
5.	Scenic Rivers	N. C. Div. of Recreation
6.	State Parks	N.C.D.N.E.R. State Parks

NO.	TITLE	SOURCE
4.	RECREATION (cont.)	
7.	State Lakes	N. C. D.N.E.R. State Parks
8.	Blue Ridge Pkwy & Appa. Trail	U.S./N.P.S.
9.	Private Rec. Facilities	N. C. Atlas
10.	Islands w/State Significance	N. C. Div. of Rec.
11.	National Wildlife Refuges	U.S./B.S.F.W.
12.	State Forests	N. C. Div. of State Forests
5.	SCENIC AREAS	
1.	One through Eleven Above (Map #4)	
2.	Overlooks & Pts. of Interest on Blue Ridge Parkway	U.S./N.P.S.
3.	Areas under Consideration as State Nat. Areas	N.C.D.N.E.R. State Parks
4.	Gardens Open to Public	N. C. Arboretum
5.	Class - A Streams	N. C. Air & Water
6.	Historic Sites Appointed to Nat. Reg.	N.C./D. of A. & H.
7.	Historic Districts Proposed & Approved by Nat. Reg.	N.C./D. of A. & H.
8.	Scenic Roads	U. S. Bur. Pub. Rds
9.	Proposed State Parks	N. C. State Parks
10.	Champions of Species	Amer. For. Assoc.
6.	HISTORIC AREAS	
1.	National Historic Landmarks	N.C./D. of A. & H.
2.	Historic Sites a. Architectural Significance b. Political Significance c. Religious Significance d. Military Significance	N.C./D. of A. & H.

NO.	TITLE	SOURCE
6.	HISTORIC AREAS (cont.)	
3.	Historic Districts a. Architectural Significance b. Political Significance c. Religious Significance d. Military Significance	N.C./D. of A. & H.
4.	Nationally Owned Historic Properties	U.S./N.P.S.
7.	WILDLIFE	
1.	Range of Virginia Deer	N. C. Div. of Wildlife Res.
2.	Range of Wild Turkey	N. C. Div. of Wildlife Res.
3.	Range of Black Bear	N. C. Div. of Wildlife Res.
4.	Areas of Mod. to High Waterfowl Value	U.S./D.S.F. & W.
5.	Rare & Endangered Species Alligator & Eagle Bob Turtle Sea Turtles Pelicans	N. C. Nat. Hist. Mus., W. Hamnett
8.	FISHERIES	
1.	Clams (Shellfish)	N. C. Comm. Fish.
2.	Fin Fish	N. C. Comm. Fish.
3.	Crustaceans	N. C. Comm. Fish.
4.	Trophy and/or Native Trout Streams	N. C. Inland Fisheries
5.	Anadromous Fish Streams	N. C. Comm. Fish.
6.	Endangered Species (Dismal Swamp Fish)	

NO.	TITLE	SOURCE
9.	SCIENTIFIC AREAS	
1.	Class - A Streams	N. C. Air & Water
2.	Regional Habitat Tracts	N. C. Arboretum
3.	State Natural Areas (proposed)	N. C. State Parks
4.	State Forests	N. C. State Forests
5.	National Forests	U.S.D.A./U.S.F.S.
6.	Wild & Scenic Rivers	N. C. Rec. Comm.
7.	Champions of Species	Nat. For. Assoc.
8.	Rare & Fragile Botanical Species	J. Radford UNC/CH